

Interactive Whiteboards in the Early Childhood Classroom

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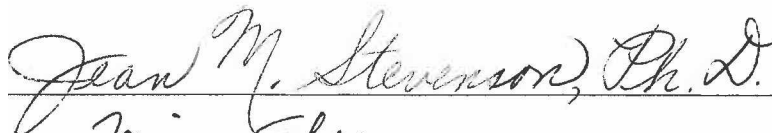
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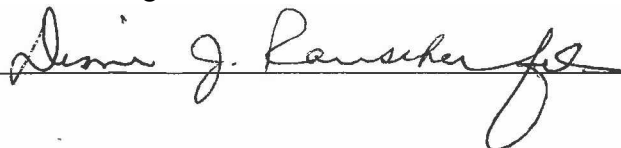
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I would like to acknowledge the hard-working teachers that took time out of their busy schedules to talk with me, as well as invite me into their classroom to observe. Without their willingness, this project could not have been completed.

Abstract

While the appearance of technology in early childhood classrooms is increasing, the research behind how to use these devices is lacking, especially in the United States. This study supplements this type of research by focusing on the teachers' perspectives of how interactive whiteboards can be used most effectively in their classrooms. Interviews with teachers, as well as classroom observations of interactive whiteboard usage, show that early childhood teachers face barriers to using this technology to its fullest potential.

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CHAPTER ONE

Introduction-Statement of Purpose

Technology is being introduced to children earlier in their schooling than ever before, and schools are being outfitted with state of the art technological resources. Students are having opportunities to learn advanced technology even before they enter kindergarten.

Purpose of Study

The purpose of this study is to examine the uses of the interactive whiteboard (IWB) in early childhood classrooms. It will explore the attitudes and approaches that teachers take when implementing this technology with their students, as well as the barriers that teachers face when using the IWB with young children. The investigation will examine the current uses in pre-kindergarten and kindergarten classrooms as well as the teachers' perspectives of how the technology is used, its value to student learning, and the effect on their teaching style, lesson preparation, and delivery.

Background-Significance of Study

Interactive whiteboards are becoming more commonly found in schools in the United States, and are even being installed in pre-kindergarten classrooms. IWBs are more prevalent in other parts of the world such as Australia, New Zealand, and the United Kingdom. In the UK, £50 million has been spent to equip schools with IWBs (Jones , Kervin & McIntosh, 2011) and 49% of primary school teachers in England have daily access to an IWB (Kennewell, Tanner, Jones & Beauchamp, 2008).

Beginning research is being done on whether or not this technology is appropriate, beneficial, or relevant for these young students. Studies show that teachers

encounter many barriers when implementing new technology, as well as providing less than adequate training for pre-service teachers to be confident and competent to use it in their future placements. Despite these difficulties with implementation, teachers express opinions that using IWBs enhances their teaching. Besides being flexible and versatile, it is efficient, making it easier to prepare, store, and share lessons as well as modeling technology skills to the students (Smith, Higgins, Wall, & Miller, 2005; Kearny & Schuck, 2008). There is a lack of research available in pre-kindergarten classrooms in the United States, as few are equipped with this technology.

Setting-Audience

This research project took place in a school district that is undergoing rebuilding and remodeling their elementary school buildings. When completed, every classroom will be equipped with an interactive whiteboard, including pre-kindergarten and Head Start classrooms. Since there are many different companies that make IWBs, it may be important to note that all classrooms being observed use a SMARTboard® brand IWB. The study included four kindergarten teachers and four pre-kindergarten teachers, all who are in their second year of using the SMARTboard®. Results of this study may be useful to teachers implementing IWB technology in their classroom, as well as administrators looking to effectively introduce IWBs in their school buildings. Pre-kindergarten teachers may also be interested in how better to prepare their students to use technology prior to entering kindergarten.

Assumptions

It is important to note that the researcher in this study is a pre-kindergarten teacher and currently uses an IWB in the classroom. While I may have preconceptions

or biases surrounding using the IWB, all attempts were made to obtain and report the perspectives of others without subjectivity. All observations were made by documenting what was seen and heard in the classroom. It is important to take into account that while all the subjects in this study had IWBs installed in their classrooms in the same school year, there were variations in their usage due to experience with technology, training, or opportunity to use it with students.

Limitations-Scope of the Study

This study will take place in one upper Midwestern school district, and the results may not necessarily represent how IWBs are used and perceived in other areas in the United States. Since all of the teachers who participated in this study are bound by the same opportunities for training and have the same resources provided by their employer, generalizations should not be made to limit other opportunities available elsewhere.

Definitions

Interactive Whiteboard (IWB) - This is a touch sensitive screen that is connected to a computer. Items on the computer are projected on the large screen for display.

The IWBs used in this study are SMARTboards®.

Information and Communication Technology (ICT) - This refers to technologies that provide access to information through communication. While this term can include the internet, cell phones, and other telecommunication methods, the focus for this study is on computers and interactive whiteboards.

Early Childhood – This term references children from birth through third grade.

Pre-kindergarten - This term refers to schooling prior to kindergarten. In this study, pre-kindergarten classrooms include students of ages three, four, and five.

Summary

This study examined the attitudes of early childhood teachers using interactive whiteboard technology to aid in delivery of instruction. It explored the benefits and barriers faced as well as the value to student learning. The aim of the study is to provide information to teachers and administrators wishing to implement IWBs in pre-kindergarten and kindergarten classrooms.

CHAPTER TWO

Literature Review

This review focuses on the methods that early childhood teachers have used to incorporate interactive whiteboards (IWB) into their classrooms, as well as the outcomes reported from IWB usage. It examines whether or not the children are engaged interactively with lessons using the IWB, keeping the instruction consistent with pedagogic goals and the theory of child development that children learn best through play. The review explores the role of the teacher as well as investigate the barriers teachers face when implementing technology in the classroom. It also focuses on the needs of teachers in order to be supported when becoming acclimated with new technology. While this review may touch on the use of other technology in early childhood classrooms, such as computers, the main focus is on IWBs.

Play Based Curriculum

When determining how best to use IWBs and other technology in an early childhood environment, we must first examine how young children learn. Piaget's theory of early development includes the notion that children are naturally inquisitive and curious. This being said, Piaget also believed that preschool and primary aged children are not capable of abstract thought. Many theorists, such as Dewey, Vygotsky, and Bruner feel that Piaget underestimated young children, and that they can become capable of understanding abstract concepts with guidance. Being taught to question and analyze can result in logical reasoning, forming hypotheses, and reflection (Breitborde & Swiniarski, 2006). Vygotsky (1967) explains that play is purposeful, and that creating imaginary situations within play is a means to developing abstract thought.

According to Plowman and Stephen (2005), education in the preschool years should be child-centered, hands on, and children should have choice during times of free play. Similarly, within the constructivist theory of child development, “Play is the primary vehicle by which young children construct knowledge and understanding” (Breitborde & Swiniarski, 2006, pp. 128). Vygotsky also believed that play is spontaneous and should be child initiated (Whitebread, Coltman, Jameson, & Lander, 2009).

While many theorists believe in the importance of child-centered play, Vygotsky takes it further by stating that children also need support from other children around them to achieve higher level thinking (Breitborde & Swiniarski, 2006). Rules of play are created through collaboration between players, whether that be child and adult or among children themselves (Vygotsky, 1967).

Having opportunities to “play” with materials before a lesson takes place can increase performance. In a study by Whitebread et al. (2009), when children were given opportunities to explore materials freely, as well as participate in hands on activities, the children showed more confidence, increased creativity, increased quality of work, and increased perseverance. These playful experiences prepared the children for problem solving and creative tasks requiring a higher level of self-regulatory performance. Additionally, Whitebread et al. found evidence of self-regulation and metacognitive behaviors occurring more often during child initiated activities and when children were working in small groups.

Next, we consider the ease of introducing an IWB into the early childhood classroom, an age where constructivist curriculum is prevalent. Following the ideas of

constructivist theorists, IWB lessons should be designed as play activities. However, Morgan (2010) found that even among teachers who value play as a vehicle to development in the early years, often their lessons were not perceived as play by the children. Miller's (2005) view states that introducing technology earlier is not more beneficial, and that children need social, hands on, child directed interactions. Yet, many activities on the IWB are hands on by nature as students physically touch the board to drag items, draw and write, create pictures, and play games. Children should also have opportunities to collaborate together to use the interactive white board (Northcote, Mildenhall, Marshall, & Swan, 2010).

Choosing Appropriate Media

There are contradictory viewpoints when determining the type and amount of technology that are appropriate for the pre-kindergarten classroom. Maynard (2010) states that all screen activity is inappropriate for children younger than age three, and ages three to five should be limited to less than 30 minutes each day. She goes on to say that those 30 minutes should be socially interactive in nature.

However, other researchers disagree. Media can provide opportunities to facilitate learning, and the potential is much greater than just a convenient delivery system (Fosnot, 1984). One study points out that all children will need to learn digital technologies to be successful in their lifetime, and starting early creates a solid foundation of digital literacy (Wolfe & Flewitt, 2010). Others deem technology as appropriate only if it meets certain criteria of evaluation. Hillman and Marshall (2009) propose six domains for evaluating media for teaching literacy with young children including interactivity, digital literacy, global citizenry, appropriateness, results and

participation. Thurlow (2009) researched websites for preschool children that promote pre-literacy skills, and rated them using the following questions for analysis. First, is the site appropriate for promoting emergent literacy? Secondly, can the children navigate the site fairly independently? Thoughtful planning is necessary to find the right media for the preschool setting (Thurlow, 2009; Hillman & Marshall, 2009).

Information and communication technology (ICT) encompasses a variety of devices that can be used in the educational setting such as computers, video, and interactive whiteboard technology. An interactive whiteboard, such as a SMARTboard®, consists of a large screen connected to a computer. The screen is touch responsive, and anything on the computer can be projected on the screen. A variation on the traditional IWB, electronic pen technology, was piloted in three schools in South Africa as a lesser expensive option to the full whiteboards (Slay, Sieborger & Hodgkinson-Williams, 2008). The pen can be used on any flat surface, eliminating the need for the full board. The pen communicates with a computer attached to a projector.

Interactive whiteboards are becoming more commonplace in countries around the world, yet guidelines on how to use them are virtually non-existent. There are currently no standards or policies that regulate ICT within the preschool setting, yet there is research that shows the benefits of usage in early childhood education (Plowman & Stephen, 2005).

Incorporating IWB Technology

Building on the notion that play is central to learning in early childhood, it must be considered how to incorporate ICT without losing focus on the philosophy of the curriculum. It is essential that the computer never replace typical preschool materials

that encourage imaginative play, such as blocks and socio-dramatic materials. In addition, activities using technology should be open-ended and collaborative, with an adult in close proximity for guidance (Maynard, 2010).

Gill and Islam (2011) found that providing shared reading experiences became much easier using the IWB. Once the lesson is prepared, it can be saved, shared, and reused. Children come to the board, rearrange sentences, interact with words, and collaborate with classmates. One teacher (Harlow, 2010) incorporated the IWB into the daily routine with ease by adapting her teaching strategies, making it an effective tool in the classroom. She used it as a shared space for language development, creating meaningful literacy learning.

Additionally, IWBs have been introduced into special needs classrooms. Using the IWB in a classroom of children with autism appears to encourage relaxation as well as spontaneous play. The software incorporates jumping, reaching, and stretching for these children with unique sensory needs. The children engage in meaningful interactions and play experiences by using their whole body to input information, as well as participate in sensory experiences (Keay-Bright, 2007).

But, are these strategies truly interactive, and how? There are two types of interactivity found in the classroom, technical interactivity and pedagogical interactivity. Technical interactivity is described as interactions with the computer or the interactive whiteboard. Pedagogic interactivity includes teaching strategies used to meet the desired outcomes in the classroom (Jones et al., 2011, Kennewell et al., 2008). When considering the two types of interactivity, technical and pedagogical, it is shown

that technical interactivity alone will not produce successful learning. Quality learning experiences require both types (Kennewell et al., 2008).

In other cases, however, teachers were unsure of how to change their teaching strategies to incorporate the interactive whiteboard in a truly interactive way. A study by Hansen (2008) showed that while the children used various other types of technology, the IWB was used only by the teacher. Kearney and Schuck (2008) found that even when children were allowed to use the IWB, the primary uses were still explicit instruction and whole class interactions. Despite these difficulties with implementation, teachers express opinions that the IWB enhanced teaching. Besides being flexible and versatile, it is efficient, making it easier to prepare, store, and share lessons as well as modeling technology skills to the students (Smith, Higgins, Wall, & Miller, 2005; Kearny & Schuck, 2008).

Regardless of contradicting beliefs about the appropriate way to integrate ICT into an early childhood classroom, there is agreement that having a knowledgeable adult nearby is essential. Maynard (2010) explains that this adult should be guiding the learning as well as limiting time, as he believes that long term usage puts the child's visual system at risk. Maynard states that children need to manipulate their three dimensional environment rather than stare at a two dimensional screen which can lead to attention and focusing disorders. Additionally, Wolfe and Flewitt (2010) believe that adult proximity encourages an interactive experience as well as develops problem solving skills.

Role of the Teacher

In using IWBs, as well as other technology, in the classroom, one recurring question is what role the teacher should take. Northcote et al. (2010) found that in order to be the most effective, the IWB should be used to facilitate student learning, rather than teacher centered control of the board. The teacher first needs to gather information, then build the curriculum, and finally be a learner alongside the students (Harlow, 2010).

Making meaningful changes to the curriculum, such as introducing new technology, can bring forward surprising results. Vincent (2007) reported a teacher who had previously engaged her students in cooperative, problem solving activities, actually began to teach in a manner that was more teacher directed when she introduced the children to the IWB. It was only after engaging in critical reflection about her strategies that she realized the shift in pedagogy, and made significant changes to create a cooperative learning environment for her students.

The teacher also is essential for providing the reflective aspect for the children in the classroom, as well as using scaffolding to guide their learning (Kennewell et al., 2008). Although the teacher is seen as a supporter, he/she is not without responsibility. While IWBs are shown to increase physical and emotional engagement, it is still required that the teacher be available and engaged to foster cognitive involvement on the part of the students (Jones et al., 2011). Implementation of new technology can be beneficial, but should not be used at the expense of known best practice (Hansen, 2008).

In a study of preschool classrooms, Plowman and Stephen (2005) found that teachers were most often supervisory and reacted only when the child requested

assistance with the technology. While some adults showed periods of guided interaction, offering explanations, questioning, and providing feedback, most often there was not enough staff available to do so. While attempting to make lessons with the interactive whiteboard truly interactive, one teacher encouraged reflection and learning from incorrect answers during whole class teaching. However, when the children were assigned to small group work, they changed their methods to obtain correct answers, contrary to learning objectives (Kennewell et al., 2008). This shows that the teacher needs to be continually available to keep the students on the path that aligns with the purpose of the lessons.

Teachers should also educate parents and families about the use of technology in school, as well as give suggestions for appropriate technology selection for home use (Maynard, 2010). Maynard places responsibility on the teacher to educate families of the dangers of extended screen usage on the visual and cognitive development of young children.

It also needs to be considered that children do not come to school empty of background knowledge. Each child brings his/her own level of digital literacy, or knowledge and ability to use various types of technology (Burnett, 2010). It is notable that children who come from low income families are more likely to lack opportunities to access technology and internet outside of school (Wolfe & Flewitt, 2010).

Plowman and Stephen (2005) discovered that while using a computer, children with greater ICT knowledge were willing to help other children with technical skills when problems were encountered. These interactions, however, were not truly collaborative, as the more knowledgeable child would most often complete the task for

the other child, offering little explanation. In a pre-kindergarten classroom with computers as a choice during free play, the most common interactions seen between children were negotiating turn taking, managing operations, and sharing enjoyment of the action on the screen (Plowman & Stephen, 2005). While these may be valuable interactions, they did not seem to be collaborative in nature.

ICT is only as effective as the teacher operating it. When the teacher lacks the skills or knowledge to use the IWB effectively, it can be more distracting than advantageous. Once the teacher becomes competent, even skilled, it allows his/her focus to be on the students rather than the delivery of content (Slay et al., 2008). Some teachers can be hesitant to use new technology, as it takes them out of their comfort zone. While technology cannot replace teachers, those teachers who do not use technology will be replaced by teachers who do (Hansen, 2008).

Outcomes of Integrating IWB in Early Childhood Classrooms

A review of the use of interactive whiteboards in early childhood classrooms shows that the lessons using this technology promote student achievement as well as increase participation, encourage cooperation, and create motivated learners (Vincent, 2007). Kearney and Schuck (2008) discovered that both the staff and students had a positive attitude regarding the IWB. Painter, Whiting, and Wolters (2006) found that students were positive in their feedback about using the IWB, while teachers changed their pedagogical strategies and provided lessons that led to student achievement gains. This study used a student voting system, in which the students input a number corresponding with their vote, and the software could analyze and graph their results.

The research shows that students become more motivated when using new technology, such as the IWB. Harlow (2010) reports that one teacher claims the IWB creates an environment of “awe and wonder” for the children. The children were given the structure to engage, were supported in grasping ideas, and were motivated to learn. In addition to being motivated, the children were more likely to participate and cooperate using the board (Vincent, 2007). In fact, in one observation by Kennewell et al. (2008), after the initial loading by the teacher, the board was entirely manipulated by the students and truly was a shared resource for the class. Motivation and engagement are increased because the board incorporates audio and visual stimulation that is favorable to a variety of types of learners (Gill & Islam, 2011). Gill and Islam attribute this to a bigger viewing area and the use of sounds and graphics that appeal to students. Northcote et al. (2010) attribute the increase in motivation to the board’s uniqueness and the way it caters to visual learners. Even in a situation where the technology was installed incorrectly and the teacher used the equipment inefficiently, the students and teacher expressed positive opinions regarding its potential (Slay et al., 2008).

When examining closely what children are learning when using the IWB, a variety of positive findings are reported. Hansen (2008) determined that technology increases reading comprehension, vocabulary, fluency, and achievement in literacy. In fact, the technology allowed the students to be engaged longer during times of exploration and application. This includes large group, teacher-directed learning as well as individual and small group practice application of skills. In many ways, the IWB was a time saver, and showed a positive impact on behavior and social learning (Northcote et al., 2010). Use of the IWB also shows more engagement (Harlow, 2010), increased

attention span (Vernadakis, Avgerinos, Tsitskari, & Zachopoulou, 2005), and extended lesson duration (Jones et al., 2011). Technical learning, such as how to hold the pen, touch the board, and where not to cast a shadow also took place (Painter et al., 2005).

Not all results showed that the classroom was enriched by incorporating ICT. Morgan (2010) found that even when teachers had time for reflection to determine if methods are aligned with program goals, teachers did not realize their lessons and goals were out of alignment. In one instance, this was only noticed by the researcher. In a study of seven preschool classrooms, the use of the computer was described as “play,” yet behaviors associated with play (fun, spontaneity, enjoyment, pleasure) were largely absent from the children using it. Children instead showed frustration, boredom, and disengagement, often switching from program to program quickly, or needing assistance to get the software running (Plowman & Stephen, 2005). Wolfe and Flewitt (2010) found that children were able to gain pre-literacy skills at a similar rate both with and without the use of technology in the classroom.

Barriers

Technology, specifically IWBs, use in early childhood classrooms is not widely researched, especially in the United States. Research determines that using technology in the preschool setting is valuable, yet there are no standards for children younger than kindergarten (Burnett, 2010).

Research has determined that the success of implementing interactive lessons using IWBs and other forms of technology relies on the teachers being comfortable and confident when using the technology themselves. Morgan (2010) found that while teachers were positive about having the interactive whiteboard in their classroom, they

felt they needed not only more time to become competent with the technology, but also access to resources to develop lessons. Researchers agree that the need for reflection on how to use new technology is essential, as technology is only as effective as the teacher who implements it (Vincent, 2007; Morgan, 2010). Teachers must be willing to change their pedagogical strategies, as well as the way classroom activities are resourced in order to successfully integrate interactive lessons using new technologies (Vincent, 2007). Another study found that using computers in an early childhood classroom can have a positive effect on learning, as long as the software is developmentally appropriate and the teachers feel competent in using the technology themselves (Vernadakis et al., 2005).

Training is essential for teachers to develop confidence and competence to use new ICT. Vincent (2007) says that teachers must have a willingness to integrate new technology into the curriculum. Another common finding among researchers is that teachers face a lack of professional development opportunities and time to practice with the ICT (Laffey & Espinosa, 2003; Kennewell & Morgan, 2003; Smith et al, 2005; Hansen, 2008).

Laffey and Espinosa (2003) investigated attitudes of pre-service teachers and their comfort level using technology in the classroom. They found that while pre-service teachers described their own skills in using technology as adequate or comfortable, they were hesitant to take on the responsibility of incorporating computers and other technology into their future teaching placements. The pre-service teachers had not been exposed to strategies on how to use the resources in their training, and felt that the likelihood of using the technology would depend on the support offered by their

future employer. However, overall, pre-service teachers were less resistant to implementing new technology, such as IWBs, than experienced teachers, as they saw it an inevitable part of their teaching career (Kennewell & Morgan, 2003).

Another barrier to IWB usage is the high cost of the technology (Northcote et al., 2010). Other options to the full, traditional IWB, such as the SMARTboard®, do exist. In a trial project in poor, previously segregated schools, the researchers chose to introduce an interactive pen technology (Slay et al, 2000). The cost is less than full IWBs and it is more portable. After the pilot, three of the five teachers claimed that a laptop connected to a projector could meet the needs of their classrooms. In addition to hardware, available space to use the technology can be limited. Painter et al. (2005) needed to bring students to a separate room that housed the IWB, which disrupted the flow of work and did not allow the board to be used as a resource throughout the school day.

Hansen (2008) found barriers to implementing ICT as well. Among those reported are lack of time to explore and understand the software, as well as teachers not having a full understanding of the capabilities of the technology. These teachers also lacked confidence to use the technology for quality instruction. Issues related to a teacher's competency can disrupt the flow of the class to the point where little learning can take place (Slay et al., 2008). Going too slow isn't the only time related barrier. Once the teacher becomes competent with using the technology, he/she can speed up the pace of the lessons and leave less room for cooperative reflection (Kennewell et al., 2008).

Conclusion

Introducing new technology, such as interactive whiteboards, into early childhood classrooms can have positive effects on cooperation, participation, motivation, and student achievement. Careful examination of software is important to choose media not only developmentally appropriate for young children, but that also is easy enough for them to operate somewhat independently. While encouraging independence, the role of the teacher is to be present and engaged, encouraging, and providing scaffolding. There are many barriers to using technology interactively, such as teachers' resistance to change, inadequate training or resources, and lack of time for teachers to become competent and confident with the technology. Additionally, teachers must engage in critical reflection of their pedagogical strategies and approaches in order to ensure that lessons are truly interactive and children are engaged in developmentally appropriate, hands-on activities. There is a need for further research on the use of interactive whiteboards in early childhood classrooms, particularly in the United States, as this technology becomes more common in these settings.

CHAPTER THREE

Methodology

As technology continues to play an important role in elementary schools in the United States, so does the need for research into the uses of interactive whiteboards and how implementation can be improved. This study attempts to identify what is working for early educators, as well as areas that IWBs can be used more effectively and efficiently. This chapter describes the setting and participants involved in the study. I then discuss the development of the interview questions and frame for observations, and conclude with how the data will be analyzed.

Setting and Participants

The participants in this study are teachers currently working in pre-kindergarten and kindergarten classrooms. All teachers have an interactive whiteboard, called a SMARTboard®, in their classroom. The kindergarten classrooms are in an elementary school that houses pre-kindergarten through fifth grade. All of the kindergarten teachers in this school were invited to participate, as were five pre-kindergarten teachers in this school district. Two pre-kindergarten teachers participating in the study also teach in this building, with a student population of about 450 students. This school is part of a district that includes nine elementary schools. The student population is 77% white, 10% black, 10% Native American, and 3% of other racial background. Eighty percent of these students qualify for free or reduced lunch, making it the elementary school with the second highest percentage in the district. Two additional pre-kindergarten teachers, who work in another similar-sized elementary school, also participated in order to gain a wider pre-kindergarten perspective.

The participants, while all currently teaching pre-kindergarten or kindergarten, have combined background experience teaching pre-kindergarten, kindergarten through fifth grade, junior high, high school, and adults. Years of teaching experience among the teachers spans from one to 31 years, with the average years being 16.

The participants were chosen mainly because they are in the unique position of using interactive white boards in their early childhood classrooms. Interview participants include three kindergarten teachers and four pre-kindergarten teachers. A total of six observations took place in three pre-kindergarten classrooms and two kindergarten classrooms.

Permission to conduct research was obtained from the school principal and Head Start Director prior to obtaining University of Minnesota Institutional Review Board (IRB) approval. Additional permission was requested from the school district following approval from the IRB.

Research Design

Data were collected from the subjects through observation and interviews. These methods were chosen to be used together to provide clear and consistent data. Interviews were conducted both prior to and following observations in order to clarify data, gain perspective of the subject, and ensure reliability of the observations. In addition, the researcher adapted the interview questions to follow the lead of the participants.

Interviews were used to gain background information on the participants. While face to face interviews were preferred, due to availability of the participants, some of the follow up interviews were conducted via telephone and email. The same questions

were used with all the participants with some variations due to format. If participants were answering questions via email, follow up questions were asked in subsequent emails.

Interview questions were developed to gain some background information about the teachers' classroom experience, as well as their experiences with technology. Additional questions addressed the availability of resources and what the teachers found to work well when they use technology. Finally, they were asked about the challenges they faced as well as any ideas they had for improving technology used in early childhood settings.

Observations were used as an attempt to give the researcher first hand insight as to what works for the teachers, as well as the manner in which the board was used. Ideally, observations took place when the teachers were using the SMARTboard® with students. The observations took place in the most natural setting for the teachers and students, as the researcher made all attempts to observe as an unobtrusive outsider.

The researcher took notes during these observations, documenting what was seen and heard in the classroom. The observations focused on three elements: how the teacher operated the IWB, if there were any obstacles that arose, and the overall delivery of the lesson. Effectiveness of the lesson was not determined by the researcher, but in some cases, the researcher asked the participants how they perceived the outcome of the lesson and what changes might be made in the future.

Data Collection and Analysis

After completing all interviews, observations, and follow up questioning, the researcher began to organize the data by looking for themes. The pre-observation interview data were divided into two groups, kindergarten and pre-kindergarten. Then, each group's interview data were searched for similarities in answers from the teachers from each grade level as well as similarities with the teachers from the other grade level. Observation notes were also searched for themes related to the following questions: In what ways did the teachers use their IWB? Was there common language used with students when using the IWB? Did common technical issues arise among the participants?

Summary

By using interviews as well as observations of early childhood classrooms, this study aimed to gain insight as to how IWBs are being used in one school district and to determine what currently works for teachers, as well as the needs of teachers to use IWB technology more effectively.

CHAPTER FOUR

Results

This study examined the usage of IWB in early childhood classrooms. While conducting interviews with teachers and observing in pre-kindergarten and kindergarten classrooms, the researcher gathered data showing how the IWBs are being used, common problems that arise, technical issues, and teachers' ideas about IWB usage with young children. This chapter introduces and explains some of what teachers described as useful and difficult about using this technology. Data also shows which skills teachers find valuable for children to know when beginning to use IWBs.

All the participants work in school buildings that were built two years prior to the study. At that time, the classrooms were outfitted with IWBs. As a result the common answer for how long the teachers have used an IWB with their students was less than two years. Most of the teachers completed the one day required training to use the IWB prior to having one in their classroom.

The most common activities in which the IWB were used in both kindergarten and pre-kindergarten classrooms were math and literacy activities. The pre-kindergarten teachers more often described literacy uses for the IWB, such as having the children learn letters, write letters, write their names, and read both books and poems. Conversely, while the kindergarten teachers mentioned literacy uses, they more often described math activities as the primary focus of their IWB lessons. These include math manipulative games and completing workbook pages as a large group and math games in small groups.

After math and literacy, the teachers from both groups reported that they use the IWB for music and movement opportunities. Teachers' examples of music activities include songs with accompanying graphics, such as *5 Green Speckled Frogs*. The children have opportunities to come to the board and move each frog into the water. Additionally, one pre-kindergarten teacher described how she used the board to regroup after transitions, often using music or movement with a visual on the board.

Large group, or whole class instruction, is the time that every teacher in the study reported as when most of their IWB instruction takes place. The teachers stated that they also use the board in small groups as well as having children work on activities individually or in pairs.

The data shows that confidence level in using the IWB varied among the teachers. Several stated that they felt very confident and comfortable, while three teachers openly expressed their discomfort using this technology. One kindergarten teacher said she is "getting better all of the time. If it is working right, I feel confident, but when it freezes, I feel like throwing it out." A pre-kindergarten teacher rated her comfort level as "a five out of ten." Teachers expressed that the more they use the IWB, the more their confidence increases.

This school district requires that teachers complete a one day training to operate the IWB. The teachers interviewed had completed one to three days of training. Three teachers commented on the district training and how it was not specific enough to meet their needs as early childhood educators. There were opportunities to break out into groups and create lessons, however, none of the groups targeted the pre-kindergarten or kindergarten level.

All teachers expressed that they knew how to access some resources for lessons. The most common method the teachers said they used to learn about materials was to collaborate with other teachers. There was some training provided by the district about where lessons are shared district wide. One teacher stated that she had also done some online searching on her own to locate additional resources.

The teachers reported that their students enjoy using the IWB, and described their behavior as excited and engaged. Both kindergarten and pre-kindergarten teachers found that the children wanted turns at the board and seemed to be interested in activities that used the IWB. One kindergarten teacher noted that, at times when they are not using the IWB, the children inquire why it is not being used. Another teacher said her students show pride when they can help her figure out technical glitches with the IWB.

During interviews, the researcher asked which skills were important for the children to master in order to operate the IWB effectively. Pre-kindergarten teachers were asked what they aimed to teach the students before they moved to kindergarten, and kindergarten teachers were asked which skills they wanted the incoming kindergarteners to already possess. There were many commonalities among the answers of all seven teachers. Five of the teachers were concerned that the children should show respect for the IWB, as it is a learning tool and is very expensive. When asked what was meant by respect, the teachers answered, “They need to learn how to take care of it,” and “not to bang on the board.” The teachers also noted when children should be made aware of times that the IWB is open for student use, as in relation to other times when the teacher only will be using the IWB or the board is not being used. One example

given of a teacher task was using the buttons for orientating the IWB and other set up functions. It is also important that the students only use the specific pens that come with the IWB to write on it.

The teachers mentioned taking time during the beginning of the school year to engage in explicit instruction regarding the functions and tools of the IWB. One kindergarten teacher used her morning meeting and attendance time to incorporate these lessons. During this time, the children have turns to practice basic skills such as writing on the board, dragging objects, and erasing. A pre-kindergarten teacher stated that her students still needed explicit instruction throughout the year as to the basics of operating the IWB.

Several specific skills related to touching the IWB were deemed essential by the teachers in the study. When using the IWB markers, it is important to hold the marker towards the end, in order to prevent fingers from dragging on the board. Dragging fingers, a palm, or even a sleeve will cause that spot to erase. Other skills mentioned were using one finger to touch and move items, how to erase, and not placing the non-writing hand on the board when writing with the other hand as children often do as they try to reach high on the board.

Data were collected to gain insight from the teachers' perspective as to whether the IWB improved instruction with students at this young age. Kindergarten teachers described IWB lessons to be more visually stimulating, more interactive, and resulting in higher student engagement. The increased visual representations helped the students focus. One kindergarten teacher stated, "Using the SMARTboard® holds their attention longer, and I find myself going further into explanations than I would have before."

She also believes the IWB played a part in enabling the children to lead more by getting them actively involved in front of the group.

The pre-kindergarten teachers agreed with many of these improvements to instruction, noting specifically the increased focus and attention, as well as the IWB allowing students to interact more. Pre-kindergarten teachers said that having an IWB in their classroom has made lesson preparation faster and more efficient. Prior to using an IWB, they gathered materials, wrote on a chalk or traditional whiteboard, used flannel boards and other props. Incorporating an IWB into the classroom allowed them to easily and quickly call up a page or file with a fingerplay, song, or story. They used the activity and saved it to be reopened at a later time. Time was saved by not gathering and cleaning up materials or resetting the activity. While it took time to initially create the activities, the teachers felt that time was saved in the long run.

Teacher perspectives of the impact on instruction varied. A kindergarten teacher stated, “I feel it has only improved instruction. However, I need to be flexible for days where the SMARTboard® is unresponsive.” A pre-kindergarten teacher described her experience in a different way, saying that the IWB had not improved her instruction. She felt that the technology is unreliable and that her own skills are not adequate enough to make it effective. Using the IWB often left her feeling frustrated and nervous that a glitch would arise that she could not fix.

The other teachers, both kindergarten and pre-kindergarten, report some unreliability with the technology as well. Power outages and computers freezing up are two instances that would halt lessons. The teachers experienced frustration and felt overwhelmed at times, especially when something unexpected arose that they didn’t

know how to fix. One kindergarten teacher stressed that it was important to be flexible when using any technology.

The teachers had several specific ideas as to what they need to become more effective in using IWB technology. The most common response from both groups of teachers was time. They need time to search for lessons, time to create activities, time to practice using the IWB, as well as time to collaborate with other teachers about what IWB lessons are useful and effective in their classrooms. Several teachers said they needed instruction in creating activities and knowing where to find lessons that had already been developed.

After completing interviews with seven kindergarten and pre-kindergarten teachers, the researcher followed up by observing in four of their classrooms. It was not possible to observe in all seven of the classrooms due to teacher scheduling and availability. Six observations were completed in four classrooms, three in each grade level. Two of the kindergarten observations took place during math lessons and one during a reading lesson. The pre-kindergarten teachers were observed during story time, music and movement, and name and letter writing practice, which all involved large-group instruction.

When observing in multiple classrooms, the researcher found some common statements that teachers made to the students as they had chances to take turns at the IWB. Some of these statements were basic technique reminders such as where to put their fingers when holding the IWB marker, how to erase on the board, how to change the marker color, and not placing the non-writing hand on the board for balance.

There were some unexpected technical issues that arose during the observations. In a kindergarten math lesson, groups of numbers were linked to enable them to be moved together. When the student moved the group, the numbers became ungrouped and moved singly. The regrouping skill needed to be done by the teacher. In a pre-kindergarten classroom, a child helper inadvertently touched a menu with his sleeve, displaying the menu box across a large portion of the screen. The teacher tried to get the menu to go away to no avail. She decided to ignore the menu and when they went back to their activity, the menu disappeared on its own.

In a kindergarten math lesson, the children were computing simple addition problems and writing the answers into a calculator graphic. It became a technical issue when the IWB calculator would only accept the number one when written with a serif at the top and a horizontal line at the base (1), and not when written with a vertical line, as the children had been taught to write the number. The children needed to add the serif and horizontal line to the vertical line in order for the IWB to recognize it. On multiple occasions, the students knew the answer to the math problem, but were unable to get the calculator to accept their answers.

In three of the four classrooms, the teachers made adaptations for the children to reach the board when taking their turn. In some cases, they raised or lowered the height of the IWB by pushing a button on the side. Two teachers offered the students a stepstool in order to reach something higher up on the screen. In the fourth classroom this was not observed, however, during this instruction the lesson was entirely teacher directed and students did not have a turn at the IWB. This teacher adjusted the height of the board for herself.

Discussion

This study found that there is a wide range of comfort levels among early childhood teachers when using IWB technology in their classrooms. Regardless of their own specific level of experience in using this technology, they do agree that, when used effectively, there are benefits for students at this age.

The most common barrier to becoming effective with the IWB is time. The data shows that teachers need time to prepare and create lessons, time to practice with the IWB, time to search for resources, and time to collaborate with other teachers. One prekindergarten teacher stressed the importance of collaboration with teachers at the same grade level. When discussing district provided time to create lessons, she said, “I feel like I don’t have the knowledge to know what to work on.” Another pre-kindergarten teacher said that she would like, “One on one time with someone knowledgeable to walk me through it until I become more comfortable.”

The teachers in this study find that using an IWB creates an interactive and hands on experience for young children, something they believe is important at this age. This parallels the ideas of Plowman and Stephen (2005) that early childhood education should be conducted in a format that allows the students to be actively and physically involved with materials. One kindergarten teacher in this study described needing materials for the children to manipulate if she didn’t have the IWB. She would then use a chalkboard or traditional whiteboard along with the manipulatives to aid in her lesson. She described the whiteboard as a time-saver by incorporating both elements of instructional and hands-on and interactive.

Gill and Islam (2011) found that teachers saved preparation time by saving and reusing activities on the IWB, particularly during shared reading. This research was corroborated by the teachers in this study. While they stated that they needed more time to create or find lessons, once they had resources available and lessons completed and available, they could be used again and again. One kindergarten reading lesson that was observed seemed to share many commonalities with the Gill and Islam research. The children moved words around and added punctuation. Children took turns in front of the group as the rest of the class read along from the carpet.

Wolfe & Flewitt (2010) state that each child arrives at school with his/her own level of digital literacy. This was seen as the teachers offered technical assistance to their students. While none of the children have an IWB at home, some students did have experience during the prior school year. Additional experience with technology such as tablets, smartphones, and computers may aid in the competency level of some students.

In this research study, all observations took place during large group instruction. In many cases, but not all, the children had opportunities to work with the IWB. Kearney and Schuck (2008) found that this is most often the case, using the IWB for whole class, explicit instruction, even when giving the children chances to participate.

Effectiveness of the technology is directly related to the skill level of the teacher in operating the IWB (Slay et al., 2008). This was also found to be true in this research. The teachers who were not comfortable in using the IWB in their instructional delivery spent more time concentrating on using the equipment. In contrast, those who

incorporated the IWB into the instruction with ease could concentrate fully on the lesson and children's learning.

Teachers reported that using the IWB increases attention, motivation and focus of their students as was also found in many prior studies (Vincent, 2007; Gill & Islam, 2011; Harlow, 2010). These researchers found that IWBs appeal to a variety of learning styles, and that students are more motivated and more likely to participate. This study reinforces prior ideas that children react positively to using an IWB.

This study is important because it provides insight into what is working for teachers in using IWBs with young children as well as what challenges they face. Teachers may find value in learning how others are changing the delivery of their instruction in order to incorporate the IWB effectively.

CHAPTER FIVE

Educational Implications

This study gives a picture into how IWBs are currently being used in some kindergarten and pre-kindergarten classrooms. By examining what is working for teachers, as well as what is challenging, efforts can then be made to improve the delivery of IWB instruction for young students. School district administrators can be made aware of resources and/or training that teachers will be able to use to improve their practice and student performance. This study also gives insight into how the children are operating the IWB, as well as the skills that are valuable for them to learn at this early level of education, as they will most likely encounter technology at every level of their schooling.

Recommendations for future research

While this study examined the perspectives of the teachers regarding IWBs, it did not focus on the student perspective. Additional research could be done by observing and questioning the students about how they see the IWB fitting into their classroom experience, as well as their level of engagement and enjoyment.

The observations made in this project were all of large group instruction. Interesting research could be done by investigating the other uses of the IWB by children in small groups or individually. The role of the teacher and the child could be examined throughout these different types of groups using the IWB.

There are an increasing number of software programs and lessons being published for IWB users. This research did not focus on what the lessons entailed, but rather the technical aspect of using the board. Additional research could be done to

investigate what programs are available, how teachers select IWB lessons, and how the lessons are evaluated. Most of the resources were district provided lessons or teacher created activities.

Summary/Conclusion

In today's schools, the delivery of instruction is changing rapidly. As more schools become equipped with the latest technology, more teachers are learning how to integrate IWBs into their classrooms. While there are many positives to IWB technology, there are also some challenges. Teachers face barriers in learning to use the IWB as well as becoming comfortable enough to deliver their lessons with confidence. Time is a key element for these teachers in their effectiveness. Examining how technology is used and discovering how it can be used to its fullest potential is essential for students.

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Appendix A

The IRB: Human Subjects Committee determined that the referenced study is exempt from review under federal guidelines 45 CFR Part 46.101(b) category #1
INSTRUCTIONAL STRATEGIES IN EDUCATIONAL SETTINGS.

Study Number: 1304E31285

Principal Investigator: Amanda Goodreau

Title(s):
Smartboard use in early childhood classrooms

This e-mail confirmation is your official University of Minnesota HRPP notification of exemption from full committee review. You will not receive a hard copy or letter. This secure electronic notification between password protected authentications has been deemed by the University of Minnesota to constitute a legal signature.

The study number above is assigned to your research. That number and the title of your study must be used in all communication with the IRB office.

For research in schools: Any changes to this research must be approved by the IRB and school district involved before initiation.

If you requested a waiver of consent or documentation of consent and you received this email, approval for the waiver has been granted.

This exemption is valid for five years from the date of this correspondence and will be filed inactive at that time. You will receive a notification prior to inactivation. If this research will extend beyond five years, you must submit a new application to the IRB before the study's expiration date.

Upon receipt of this email, you may begin your research. If you have questions, please call the IRB office at [\(612\) 626-5654](tel:612-626-5654).

You may go to the View Completed section of eResearch Central at <http://eresearch.umn.edu/> to view further details on your study.

The IRB wishes you success with this research.

Appendix B

Laura MacArthur Elementary School

720 North Central Avenue

Duluth, Minnesota 55807

218-336-8900

(fax) – 218-336-8904

Nathan Glöckle, Principal

Nancy Elmore, Secretary



March 15, 2013

Dear IRB Committee,

As Principal at Laura MacArthur Elementary School, give permission for Amanda Goodreau to conduct research at our school by interviewing and observing teachers at the preschool and kindergarten level regarding Smartboard use in the classroom. The research that will be collected by Amanda will be used in her graduate coursework for UMD. She has agreed to keep all school and participant identifying factors confidential.

Sincerely,

Nathan Glöckle, Principal

Appendix C

*Duluth Public Schools/Duluth Head Start
2102 N. Blackman Ave.
Duluth MN 55811*

March 15, 2013

Greetings,

Amanda Goodreau, Head Start teacher with the Duluth Public Schools/Duluth Head Start program has requested permission to observe and interview fellow teachers as a part of her master's research project. Amanda has agreed to conduct this research on her personal time and to obtain the permission of those she is interested in observing and interviewing. This research does not conflict with her work here at Head Start; in fact we are excited to hear her findings.

Thanks you for your time and consideration of this matter. Please feel free to contact me should questions or concerns arise.

Sincerely,

Pam Rees

*Pam Rees
Director
Duluth Public Schools/Duluth Head Start
2102 N. Blackman Ave.
Duluth MN 55811
218-336-8815
Pamela.Rees@duluth.k12.mn.us*

Appendix D

Hello Amanda,

I had a chance to review your Research Request with our Assistant Superintendent. It is approved. You are welcome to proceed with your research, based on the description you provided.

Best wishes~
Tawnyea

Tawnyea L. Lake, PhD, NCSP
Director of Assessment, Evaluation, and Performance
Duluth Public Schools

Duluth Public Schools | 215 North 1st Avenue East | Duluth | MN | 55802

Appendix E

Informed Consent Form

My name is Amanda Goodreau, and I am a student in the Masters of Education program at the University of Minnesota-Duluth. I am doing research into how SMARTboards are used in early childhood classrooms in ISD 709. In Duluth, preschool and kindergarten classrooms are being equipped with SMARTboards district-wide, a feature that is not common in the United States.

Preschool and Kindergarten teachers using SMARTboards in their classroom are being asked to participate in this study in order to gather information about methods of implementation, barriers, training and resources. By participating in the study, you will provide information that may help school districts learn the most effective ways to introduce Smartboard technology, offer resources and training support, as well guide teachers in delivery of lessons and effective instruction for young children using technology. If you choose to participate, your responses will not be linked with any identifying information as privacy and confidentiality are important.

Please indicate if you are willing to participate by (check those that apply):

_____ I am willing to be interviewed about SMARTboard use in my classroom.

_____ I am willing to be observed using the SMARTboard with my class.

_____ I am open to being interviewed and observed in the classroom.

_____ I do not wish to participate.

Your participation is appreciated and valued. If you have any questions or concerns, please feel free to contact me at 336-8900 x3118 or by email

Amanda.Goodreau@duluth.k12.mn.us. Thank you!

Appendix F

Interview-Kindergarten teachers

Date

Interviewee

How long have you been teaching?

What grade levels have you taught?

How long have you used a Smartboard with your students?

What types of activities do you use the Smartboard for?

Which parts of your day do you use it the most?

How confident/competent do you feel using the Smartboard?

How has it improved your instruction? How has it improved the delivery of instruction?

In what ways has it made delivery of instruction more difficult/complicated?

What do you need to be more effective using the Smartboard?

What has been hard about implementing lessons using this technology?

What training have you had regarding the operation of the Smartboard or developing lessons on the board? How much training is required by your district and what training, if any, did you seek additionally on your own?

Do you know where to access materials? How did you learn about this?

What reactions do you get from the students regarding the Smartboard?

<kindergarten teachers only> Some kids will come to kindergarten having had experience using the Smartboard in head start. What is important, in your opinion, for them to know entering kindergarten?

Appendix G

Interview-pre-kindergarten teachers

Date

Interviewee

How long have you been teaching?

What grade levels have you taught?

How long have you used a Smartboard with your students?

What types of activities do you use the Smartboard for?

Which parts of your day do you use it the most?

How confident/competent do you feel using the Smartboard?

How has it improved your instruction? How has it improved the delivery of instruction?

In what ways has it made delivery of instruction more difficult/complicated?

What do you need to be more effective using the Smartboard?

What has been hard about implementing lessons using this technology?

What training have you had regarding the operation of the Smartboard or developing lessons on the board? How much training is required by your district and what training, if any, did you seek additionally on your own?

Do you know where to access materials? How did you learn about this?

What reactions do you get from the students regarding the Smartboard?

<Head start/prek teachers> What do you think Head Start children should know about the Smartboard when entering kindergarten?

Appendix H

Observation Form and Follow-up Questions

What is the purpose of the lesson?

Did you feel your lesson met the objective?

Did the students react how you expected? What was unforeseen?

How did the SMARTboard aid in your lesson?

How would you have implemented this lesson if you didn't have a SMARTboard?

Was the SMARTboard essential in for this instruction?

If you were to do this activity again, what changes would you make? Why would you make those changes?

As you reflect on this activity and previous activities, what ideas or insights are you discovering about incorporating the SMARTboard into your teaching?

What type of explicit instruction on how to use the SMARTboard did you do with your students?

What adaptations have you made for students to use the board?

What was explicit instruction?	What was whole class/interactive?
What observed was technological?	What observed was pedagogical?